



COMMUNICATIONS INC.

# **SERVICE MANUAL**

## **2805 TONE DECODER**

# **MODEL MA-337/338**





# SECTION 1 - GENERAL DESCRIPTION

## 1-1 DESCRIPTION

## TABLE OF CONTENTS

### SECTION 1 GENERAL DESCRIPTION

- 1-1 Description
- 1-2 Specifications
- 1-3 Equipment Supplied
- 1-4 Patch Field Programming
- 1-5 Installation

### SECTION 2 CIRCUIT DESCRIPTION AND OPERATION

- 2-1 Circuit Description

### SECTION 3 FIGURES AND SCHEMATICS

- 3-1 Schematic
- 3-2 Parts Placement
- 3-3 Parts Overlay
- 3-4 Figures
  - a. ID Number Patch Field (Fig. 1)
  - b. Wave Form Chart (Fig. 2)
  - c. Block Diagram (Fig. 3)
  - d. Parts Placement MCH,MCBH (Fig. 4)
  - e. Parts Placement MCL, MCBL (Fig. 5)
  - f. Parts Placement MCU,MCBU (Fig. 6)
  - g. Parts Placement XLH (Fig. 7)
  - h. Parts Placement MCPH-A (Fig. 8)
  - i. Parts Placement MCPU (Fig. 9)

### SECTION 4 PARTS LIST

- 4-1 a. MA-337
- 4-2 b. MA-338

## 1-4 PATCH FIELD PROGRAMMING

Refer to Schematic and Layout Diagrams as necessary.

1. Install ID Number Patchers (Fig. 1)

2. Locate and wire the patch field by connecting the appropriate digit wire through the patch field to the corresponding decimal number for that digit. (Do this for digits 1 through 7 of the ID number.) If only a four-digit code ID is desired, omit CH1331 and CH1332, and run J11305, J11306, and J11307 to any empty decimal number hole.

Setting up a table may reduce the possibility of error.

# TABLE OF CONTENTS

SECTION 1	GENERAL DESCRIPTION
1-1	Description
1-2	Specifications
1-3	Equipment Included
1-4	Wiring Field Diagram
1-5	Installation
SECTION 2	CIRCUIT DESCRIPTION AND OPERATION
2-1	Circuit Description
SECTION 3	WIRING AND TERMINATION
3-1	Wiring
3-2	Panel Placement
3-3	Panel Overlay
3-4	Diagram
4-1	IP Network Patch Field
4-2	Wiring Patch Chart
4-3	Block Diagram
4-4	Panel Placement WCN, WCNB
4-5	Panel Placement WCN, WCNB
4-6	Panel Placement WCN, WCNB
4-7	Panel Placement WCN, WCNB
4-8	Panel Placement WCN, WCNB
4-9	Panel Placement WCN, WCNB
4-10	Panel Placement WCN, WCNB
SECTION 5	WIRING LIST
5-1	WA-117
5-2	WA-118



## SECTION 1 - GENERAL DESCRIPTION

### 1-1 DESCRIPTION

The MA-337/338, 2805 Tone Decoder Option, is to be used in a Radio Common Carrier (RCC) system. It decodes a 2805 tone in both long (7 digit) and short (4 digit) codes. Upon receipt of a correct code, the decoder opens the receiver squelch and sounds an audible alarm for approximately 5 seconds. When used in the XLH 2000 Series receiver, it also lights the message light. When used in a mobile radio, it has an output to actuate a horn relay. It also has a built-in scanner programmed to lock-up on the receipt of the proper 2805 ID code. (For use in the MCB Series or XL2000 Series Radios.)

### 1-2 SPECIFICATIONS

#### A. MA-337

Size	- 3.0"/1.6"/.4"
Pwr. Requirement	- +13 VDC +20% @ .025 amps
Sig. strength	- carrier of 12dB SINAD
Sig. type	- 2805 Hz tone, interrupted @ 8-20 pps with min. FM deviation of 1 KHz
Audible alarm	- 620 Hz, 5 sec duration
Scan rate	- 8 channels per sec

B. MA-338 - Size - 2.15"/1.29"/.40"  
Signal Requirements - same as MA-337

### 1-3 EQUIPMENT SUPPLIED

- A. Decoder Board
- B. Wiring Kit

### 1-4 PATCH FIELD PROGRAMMING

Refer to Schematic and Layout Diagrams as necessary.

#### A. Install (ID) number jumpers (Fig. 1)

1. Locate and wire the patch field by connecting the appropriate digit wire (brown through violet) to the corresponding decimal number for that digit. (Do this for digits 1 through 7 of the ID numbers.) If only a four-digit code ID is desired, omit CR1221 and CR1222. and run JUL205, JUL206, and JUL207 to any empty decimal number hole.

Setting up a table may reduce the possibility of error.



Example: ID Number - 315-2643

Wire Color	Brn	Red	Org	Yel	Grn	Blu	Vio
Digit	D1	D2	D3	D4	D5	D6	D7
Decimal # of Digit	3	1	5	2	6	4	3

Referring to Figure 1:

Connect D1 (JUL201, Brn wire) to 3.

Connect D2 (JUL202, Red wire) to 1.

Connect D3 (JUL203, Org wire) to 5.

Connect D4 (JUL204, Yel wire) to 2.

Connect D5 (JUL205, Grn wire) to 6.

Connect D6 (JUL206, Blu wire) to 4.

Connect D7 (JUL207, Vio wire) to D1. (Note: This is the same as Digit 1 and is connected to Digit 1 in the hole provided.)

## 1-5 INSTALLATION

### I. MA-337 Installation for Microcom and XL Series Radios.

#### A. Installation for MCH40, MCL60, MCU30, and MCB Series radios (See Figures 4 through 6).

##### 1. Install JO jumper wires between the option board and the radio as follows:

- a. Connect a wire from "G" to "G".
- b. Connect a wire from "P1" to "P1".
- c. Connect a wire from "K5" to "K5".
- d. Connect a wire from "AØ" to "AØ".
- e. Connect a wire from "A8" to "A8" Pin 1 of IC202 (if audible alarm desired).
- f. Remove K8-K9 jumper on main board and connect a wire from "K26" to "K9".
- g. Connect a wire from "K27" to "K8".
- h. Connect a wire from "D3" to Pin 1 of J4 (if horn relay driver is to be used).
- i. Connect a wire from "DØ" to "DØ".  
(Do not use in MCB series radios.)
- j. Connect a wire from "D6" to "D6" (STEP) on interconnect board (MCB Series only).



2. Remove J1209 on option board.
3. Install the option board in one of the two option board slots using two No. 4 sheet-metal screws.
4. The K5 line can be wired through one of the option switches to disable the decoder from holding the radio squelch on. (The decoder will still function.)

B. MA-337 Installation for XL2000 Series Radios.  
(See Figure 7)

1. Install JO wires between the option board and the radio as follows:
  - a. Connect a wire from "G" to "G".
  - b. Connect a wire from "P1" to "P1".
  - \*c. Connect a wire from "C5/D1" to "D1".
  - \*\*d. Remove R587. Connect a wire from K5 to Pin 3 of J5, the mic jack.
  - e. Connect a wire from "A0" to "A0".
  - f. Connect a wire from "A8" to "A8" Pin 1 of IC202 (if audible alarm desired).
  - g. Connect a wire from "K26" to "K26". (Remove R454 on earlier models.)
  - h. Connect a wire from "K27" to "K27".
  - i. Connect a wire from "D6" to "D6" (STEP) on the control board (STEP is Pin 9 of IC110 on early XLH257 control boards) if the scanning function is desired.
  - j. Connect a wire from "D3" to Pin 2 of J1 if the horn relay driver is desired.

\*In later XL2000 Series models D0 is used instead of the D1 pin; if so, connect a wire from "D0" to "D0" on the control board.

\*\*On later XL2000 Series models reconnect the wire from K5 of the main board to K5 on the option board.

2. Install the option board in the radio. The board mounts on an angle bracket next to the speaker using two No. 4 sheet metal screws.
3. The K5 line may be routed through the option switch to allow the user to disable the decoder from holding the radio in a squelched mode. (The decoder will still function.)

## II. MA-338 Installation (See Figures 9 and 10)

A. Using ribbon cable supplied, solder to the radio circuits as follows:

1. Connect black wire (G) to ground.
2. Connect brown wire from the base of Q211 to TX A+ through a 22K resistor.
3. Connect red wire (P1) to A+.
4. Connect orange wire (K7) to squelch switch.
5. Connect yellow wire (A0) to audio source.

B. Place option board into radio, using the "fish-paper" supplied.



## SECTION 2 - CIRCUIT DESCRIPTION AND OPERATION

### 2-1 CIRCUIT DESCRIPTION (Refer to Schematic and Fig. 2, as needed)

The incoming detected audio from the receiver (audio level should be at least 20 mVrms) enters the 2805 decoder at point AØ, where it is amplified by Q1201. The audio then enters IC1207 at Pin 3. IC1207, an NE567, is a phase-lock loop comprised of a reference oscillator, a phase comparitor, and a detector. The timing for the reference oscillator consists of R1201 and C1203 which are connected to Pins 5 and 6 of the IC. Upon reception of a tone of the correct frequency, Pin 8 of IC1207 will go to a logic "0" state (TONE). The output of the tone detector is shaped and changed into various wave forms so the pulse train sent out by the base station can be properly decoded.

The logic signal TONE is delivered through a shaping circuit to Pin 14 of IC1204 which counts negative transitions corresponding to the numerical value of the digit dialed, i.e. two negative pulses for a two, three negative pulses for a three, etc. The other input to IC1204 is called digit reset and is found at Pin 15. It goes low at the start of a digit code and remains low for the duration of that code, at which time it returns to a high which resets the pulse counter (composed of IC1204 and IC1205A). This signal also enables the correct digit pulse to be coupled through Schmitt trigger, IC1206 to Pin 10 of the digit counter, IC1205B. The three output lines from IC1205B are called X, Y, and Z (Pins 11, 12, 13). These lines deliver a three-bit binary code to the comparitor, IC1203 at Pins 11, 10, and 9. These logic levels are also taken through three diodes, CR1215, CR1216, and CR1217, which forms a nand gate to create the signal DCD. DCD is normally low and goes high upon receipt of a correct number. The combination of these three diodes that are removed or left in the circuit, determines how many digits are accepted as a complete code. When DCD goes high it charges up C1213 and turns on Q1203. Q1203 turns on Q1204 and Q1205 which grounds "D3" (the output to the horn relay). Q1203 turning on, also turns off Q1202, which allows Pin 2 of IC102 to go positive, starting the 620 Hz oscillator, which is fed to point "A8". The DCD signal is also fed through inverter Q1211 to the set side (Pin 13) of a latch (comprised of IC1206F and IC1206A).

The latch outputs, Pins 12 and 2 of IC1206, control circuitry to alert the user that a call has been decoded. The DØ line is pulled low capable of driving a message light directly. With J1208 installed, the Q output (Pin 12 of IC1206) becomes the decoder output line D1. The K7 line provides a logic "1" when the latch is set. The Q line (Pin 2 of IC1206) controls the squelch switch Q1208. When Q goes low Q1208 opens up to allow K27 to be pulled up by R1222 and R1229. The Q line also stops the radio from continuing to scan by disabling Q1206 through CR1213. IC1202B is the scan oscillator which provides an 8 Hz pulse to Q1206.



The scanner is also disabled when the microphone is lifted off-hook, i.e. allows K5 to go high and turns on Q1209. The latch is also reset by turning on Q1209 by pulling Pin 1 of IC1206 low.

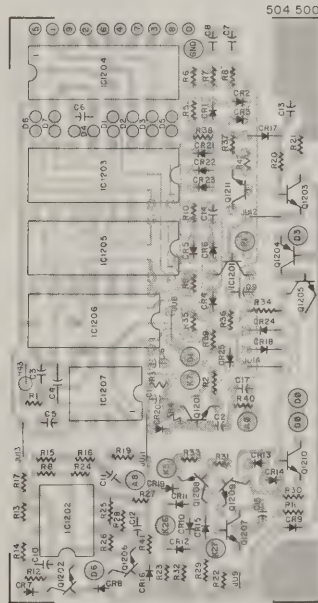




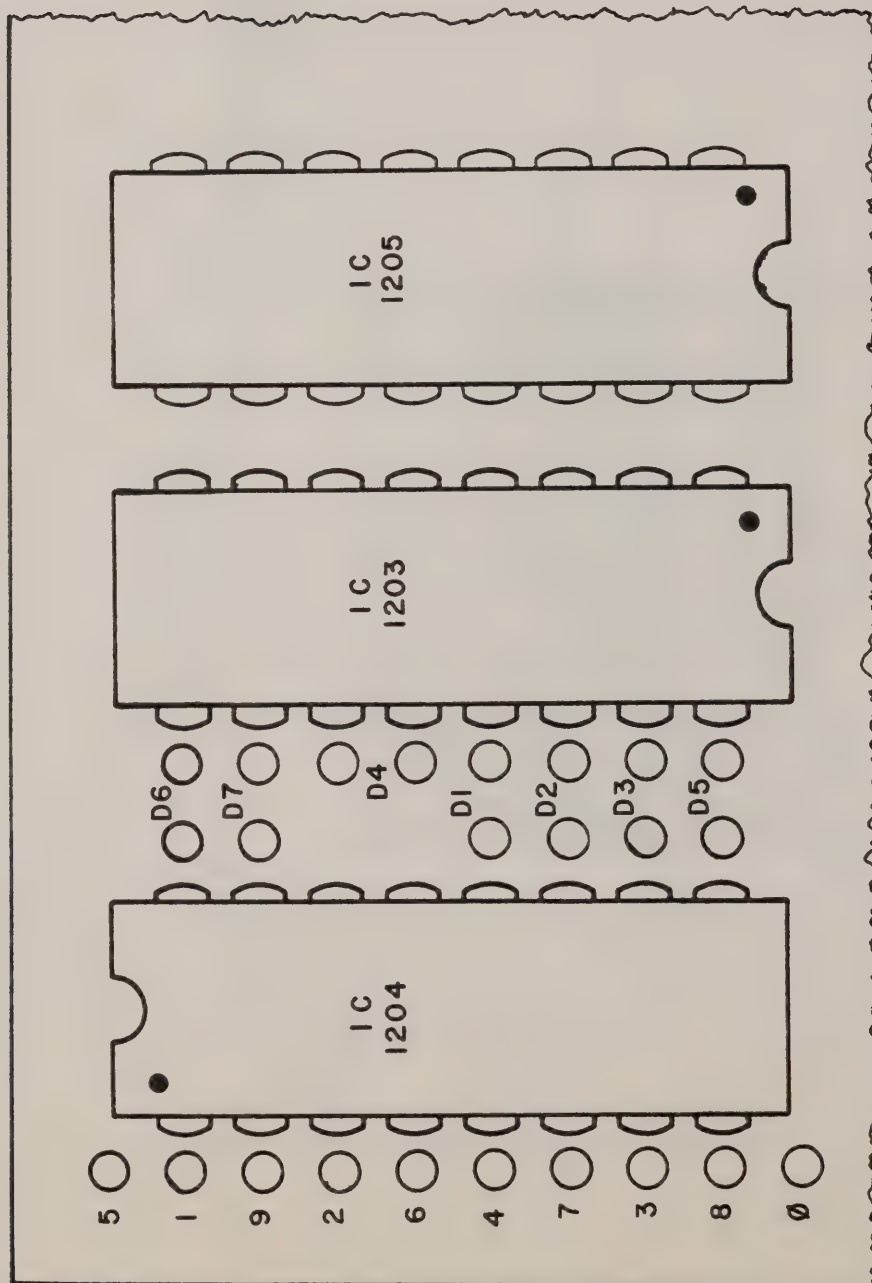




REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
1	REVISED	05/05/80	
2	REVISED	05/05/80	
3	REVISED	05/05/80	



COMMUNICATIONS INC.	
SATELLITE BEACON, FLORIDA 32037	
PARTS OVERLAY	
MA-337-338	
504-502	
504-500	



PATCH WIRE COLOR CODE	
D1	BROWN
D2	RED
D3	ORANGE
D4	YELLOW
D5	GREEN
D6	BLUE
D7	VIOLET

I.D. NUMBER PATCH FIELD

FIGURE 1



ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	RELEASE R-581	5-13-81	HDT

END  
SIGNALING

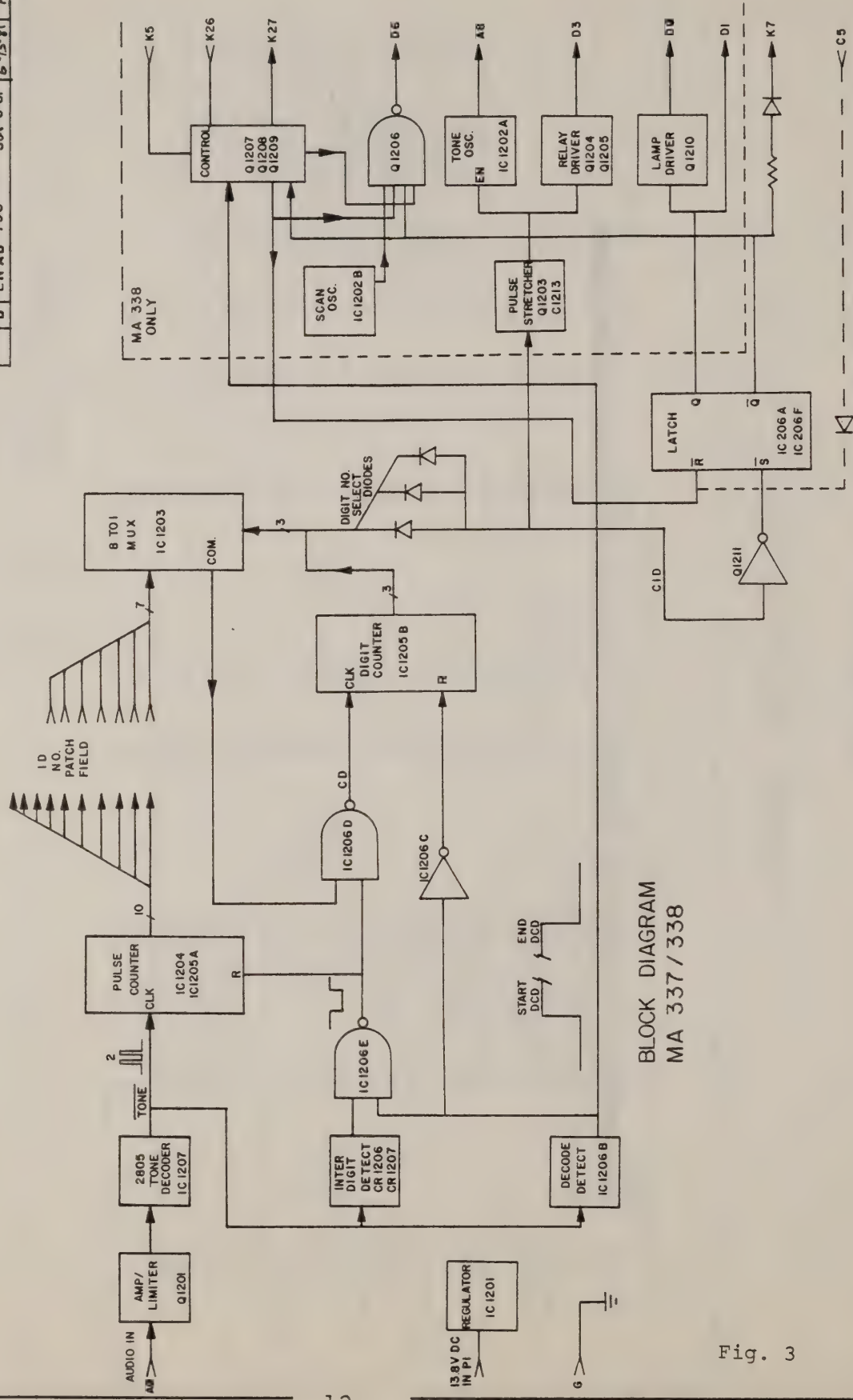


-11-

770 FULL

1 2 3 4

REVISIONS			
ZONE	REV	DESCRIPTION	DATE
	A	RELEASE R-581	5-11-81
	B	EN AB-790	6-15-81
			HDT



DWG. NO 504-549

APPROVALS		DATE	5-81
DESIGNED		5-81	
CHECKED		5-81	
DRAWN		5-81	
MATERIAL			
NEXT ASSY		MA 337/338	
USED ON			
APPLICATION			
DO NOT SCALE DWG.			
BLOCK DIAGRAM			
MA 337/338			
PART NUMBER		504-549	
SCALE			
SHEET		1	OF 1

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SATELLITE BEACH, FLORIDA 32837

Fig. 3



NOTE - D6 (STEP) IS ON INTER-CONNECT BD. (MCBH ONLY).

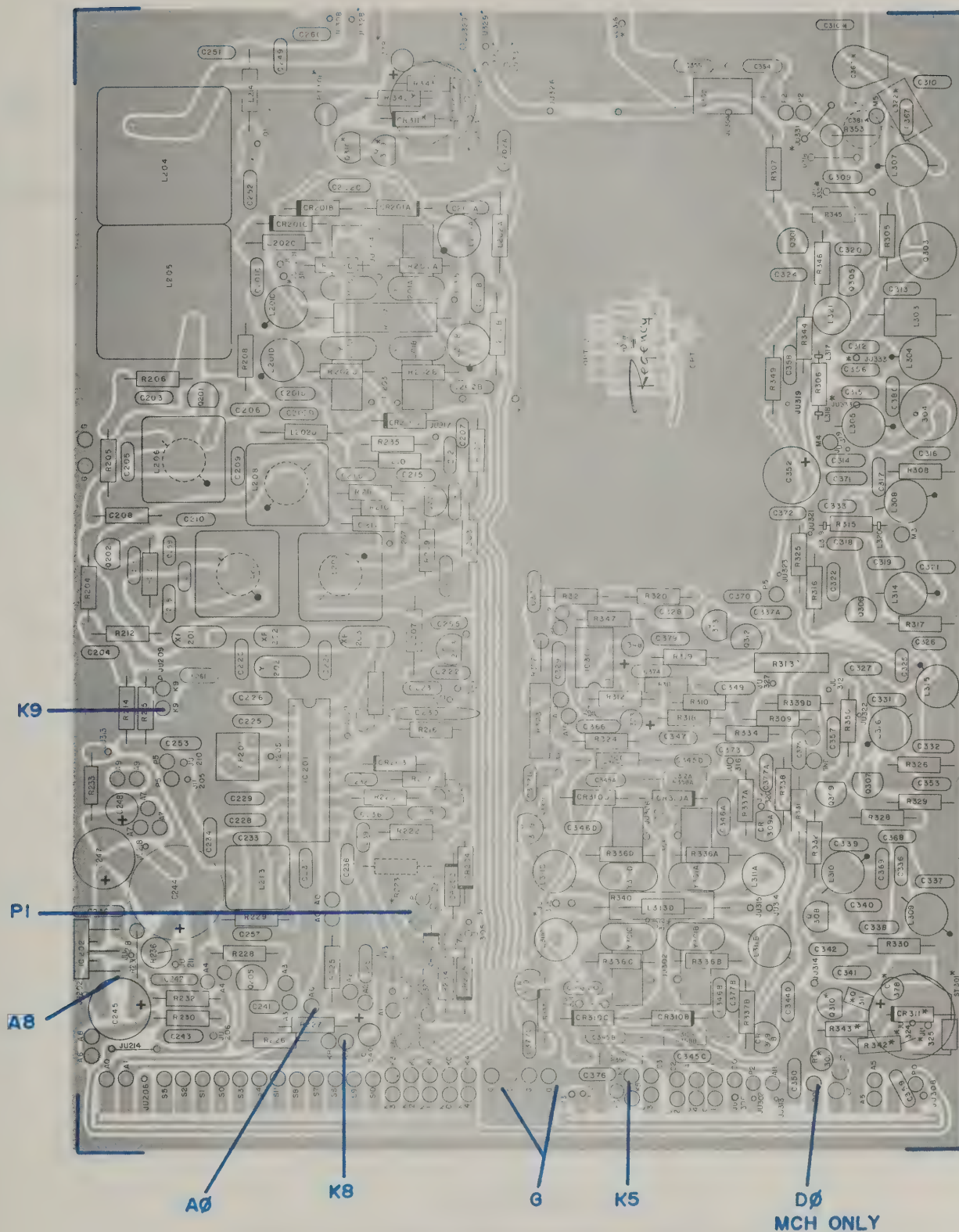


FIGURE 4  
MCH, MCBH MAIN BOARD PARTS PLACEMENT

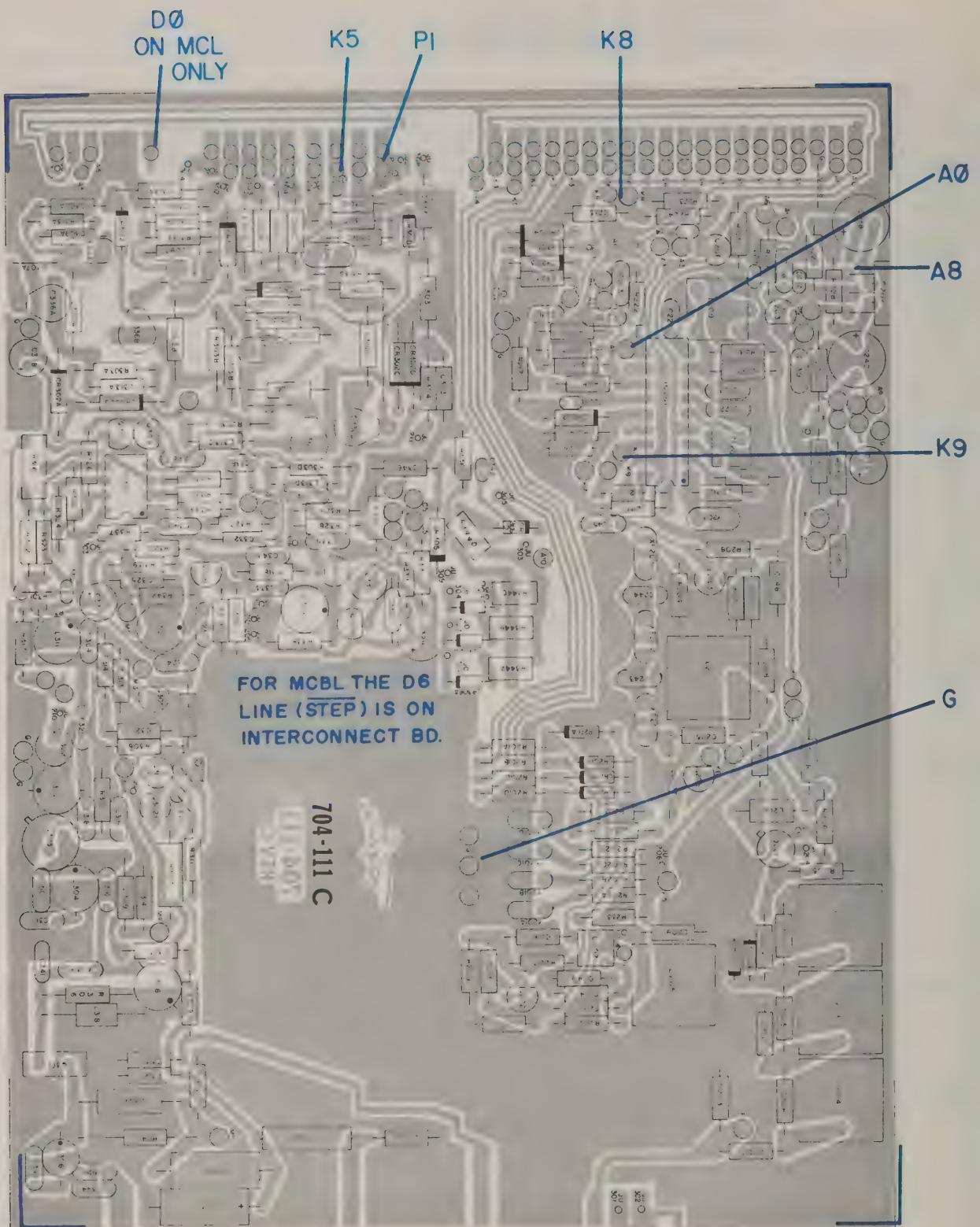


FIGURE 5  
MCBL, MCL MAIN BOARD PARTS PLACEMENT



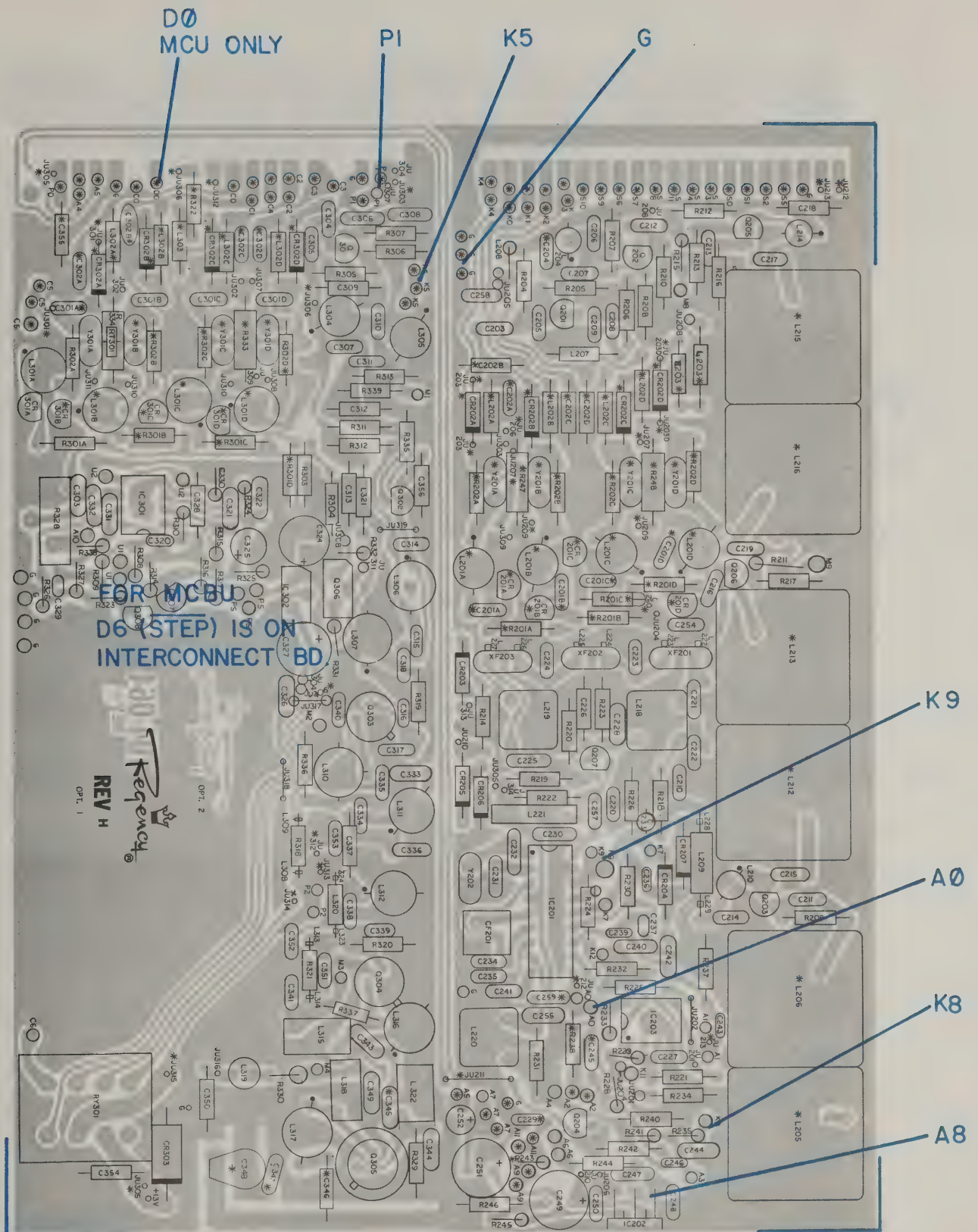


FIGURE 6  
MCU, MCBU MAIN BOARD PARTS PLACEMENT







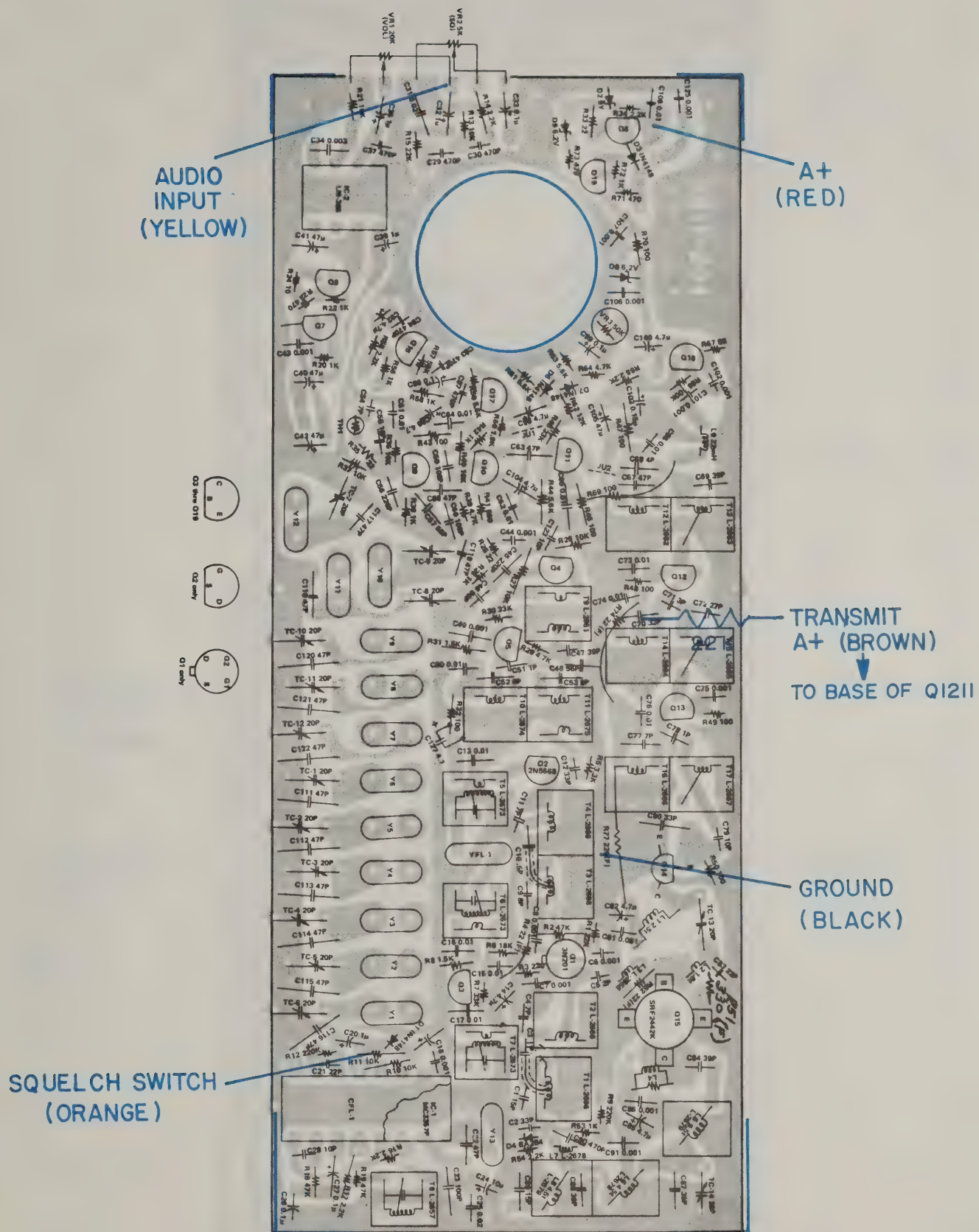


FIGURE 8  
MA 338 TIE POINT  
MCPH-A SERIES

AUDIO  
INPUT  
(YELLOW)

A+  
(RED)

SQUELCH  
SWITCH  
(ORANGE)

GROUND  
(BLACK)

TRANSMIT A+  
(BROWN)

TO BASE  
OF Q1211

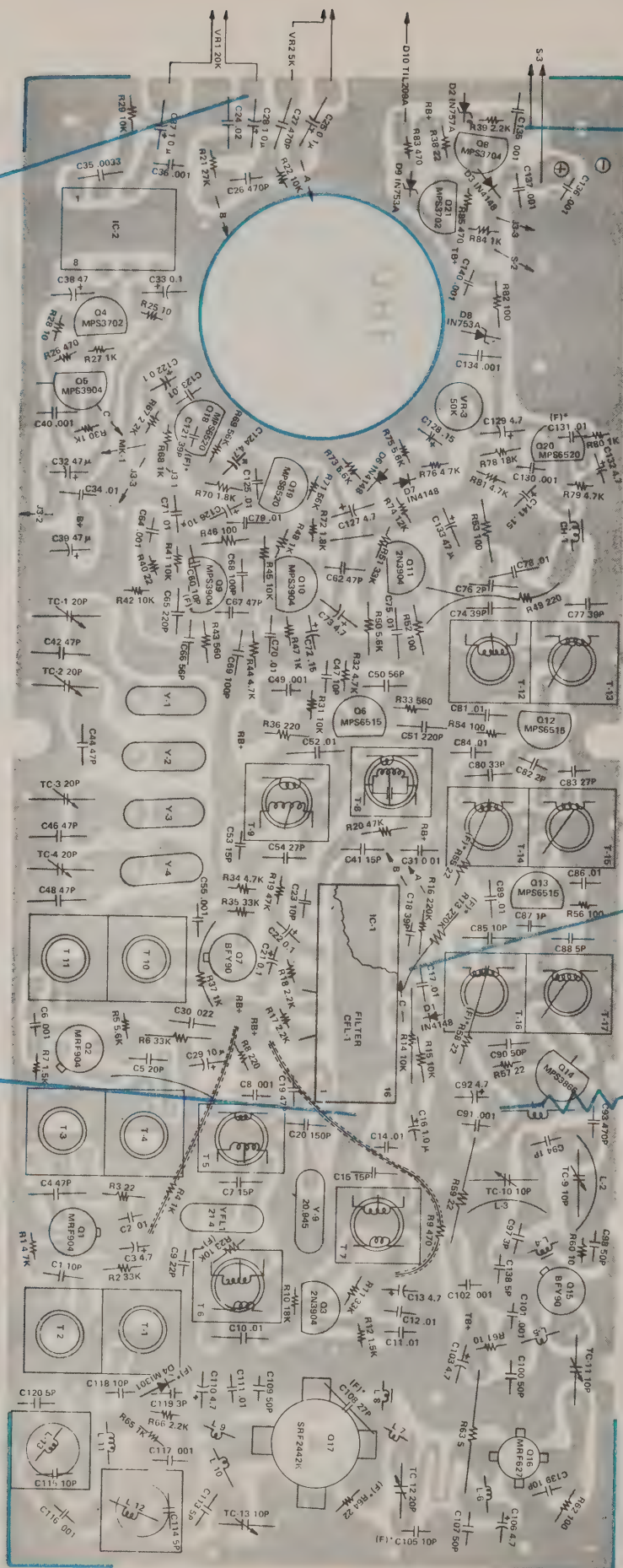


FIGURE 9

MA-338 TIE POINTS FOR MCPU



## SECTION 4 PARTS LIST

4-1 - MA-337

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>ZONE</u>
<u>RESISTORS</u>			
R1201	15K, 1%	4709-1502-011	D-8
R1202	1K, 1/8W 5%	4704-0102-031	C-6
R1203	10K, 1/8W 5%	4704-0103-031	D-6
R1204	100K, 1/8W 5%	4704-0104-031	D-6
R1205	4.7K, 1/8W 5%	4704-0472-031	C-7
R1206	47K, 1/8W 5%	4704-0473-032	B-8
R1207	1 meg, 1/8W 5%	4704-0105-032	B-8
R1208	150K, 1/8W 5%	4704-0154-032	B-8
R1209	1 meg, 1/8W 5%	4704-0105-031	B-7
R1210	100K, 1/8W 5%	4704-0104-031	A-7
R1211	10K, 1/8W 5%	4704-0103-031	C-4
R1212	10K, 1/8W 5%	4704-0103-031	C-4
R1213	100K, 1/8W 5%	4704-0104-031	C-4
R1214	1 meg, 1/8W 5%	4704-0105-031	C-3
R1215	47K, 1/8W 5%	4704-0473-031	C-3
R1216	100K, 1/8W 5%	4704-0104-031	C-3
R1217	100K, 1/8W 5%	4704-0104-031	C-4
R1218	100K, 1/8W 5%	4704-0104-031	C-3
R1219	10K, 1/8W 5%	4704-0103-031	C-3
R1220	470K, 1/8W 5%	4704-0474-031	C-5
R1221	470K, 1/8W 5%	4704-0474-031	C-4
R1222	390K, 1/8W 5%	4704-0394-031	C-3
R1223	47K, 1/8W 5%	4704-0473-031	C-3
R1224	100K, 1/8W 5%	4704-0104-031	C-4
R1225	100K, 1/8W 5%	4704-0104-031	C-4
R1226	10K, 1/8W 5%	4704-0103-031	C-4
R1227	100K, 1/8W 5%	4704-0104-031	B-4
R1228	1 meg, 1/8W 5%	4704-0105-031	B-4
R1229	10K, 1/8W 5%	4704-0103-031	B-3
R1230	10K, 1/8W 5%	4704-0103-031	B-4
R1231	10K, 1/8W 5%	4704-0103-031	B-3
R1232	100K, 1/8W 5%	4704-0104-031	B-3
R1233	10K, 1/8W 5%	4704-0103-031	B-3
R1234	10K, 1/8W 5%	4704-0103-031	B-3
R1235	100K, 1/8W 5%	4704-0104-031	B-4
R1236	100K, 1/8W 5%	4704-0104-031	B-4
R1237	10K, 1/8W 5%	4704-0103-031	A-4
R1238	10K, 1/8W 5%	4704-0103-031	B-5
R1239	10K, 1/8W 5%	4704-0103-031	A-3
R1240	4.7K, 1/8W 5%	4704-0472-031	D-5
R1241	10K, 1/8W 5%	4704-0103-031	C-4
R1242	4.7K, 1/8W 5%	4704-0472-031	C-6
R1243	*1.3K, 1/8W 5%	4704-0132-031	D-8
<u>CAPACITORS</u>			
C1201	CM .01mf rad lead	1518-0103-005	D-7
C1202	CM .01mf rad lead	1518-0103-005	D-6
C1203	CM .022mf 5%	1518-0223-006	C-8
C1204	CM .47mf rad lead	1518-0474-005	C-8
C1205	CM .lmf rad lead	1518-0104-005	C-7
C1206	CM .lmf rad lead	1518-0104-005	C-6
C1207	Tant 2.2mf	1515-0229-005	B-7

\*nominal value only

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>ZONE</u>
C1208	CM .47mf tant	1515-0478-008	B-8
C1209	Tant 2.2mf	1515-0229-005	D-4
C1210	TC .001	1538-0102-703	C-4
C1211	CM .01 rad lead	1518-0103-005	C-3
C1212	CM .1mf rad lead	1518-0104-005	B-4
C1213	Tant 4.7mf	1515-0479-010	B-4
C1214	CM .01 rad lead	1518-0103-005	B-5
C1215	Tant 2.2mf	1515-0229-005	C-4
C1216	CM .01 rad lead	1518-0103-005	A-4
C1217	CM .01 rad lead	1518-0103-005	D-5

#### TRANSISTORS

Q1201	SPS-952-2 NPN	4801-0000-016	D-6
Q1202	SPS-952-2 NPN	4801-0000-016	C-4
Q1203	SPS-952-2 NPN	4801-0000-016	C-4
Q1204	MPS-A-55 PNP	4801-0000-001	C-4
Q1205	SJE649	4802-0000-002	C-4
Q1206	SPS-952-2 NPN	4801-0000-016	C-3
Q1207	SPS-952-2 NPN	4801-0000-016	C-3
Q1208	SPS-952-2 NPN	4801-0000-016	B-3
Q1209	SPS-952-2 NPN	4801-0000-016	B-3
Q1210	SPS-952-2 NPN	4801-0000-016	B-3
Q1211	SPS-952-2 NPN	4801-0000-016	B-4

#### DIODES

CR1201	IN4148	4805-1241-200	B-8
CR1202	IN4148	4805-1241-200	B-7
CR1203	IN4148	4805-1241-200	B-7
CR1204	IN4148	4805-1241-200	B-7
CR1205	IN4148	4805-1241-200	B-7
CR1206	IN4148	4805-1241-200	A-7
CR1207	IN4148	4805-1241-200	C-4
CR1208	IN4148	4805-1241-200	C-4
CR1209	IN4148	4805-1241-200	C-4
CR1210	IN4148	4805-1241-200	C-3
CR1211	IN4148	4805-1241-200	C-3
CR1212	IN4148	4805-1241-200	B-3
CR1213	IN4148	4805-1241-200	B-4
CR1214	IN4148	4805-1241-200	B-4
CR1215	IN4148	4805-1241-200	B-3
CR1216	IN4148	4805-1241-200	C-4
CR1217	IN4148	4805-1241-200	B-4
CR1218	IN4148	4805-1241-200	B-5
CR1219	IN4148	4805-1241-200	B-3
CR1220	nqt used		
CR1221	IN4148	4805-1241-200	A-5
CR1222	IN4148	4805-1241-200	A-5
CR1223	IN4148	4805-1241-200	A-5
CR1224	IN4148	4805-1241-200	B-3
CR1225	IN4148	4805-1241-200	A-3



<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>ZONE</u>
<u>INTEGRATED</u>			
<u>CIRCUIT</u>			
IC1201	8V REG 78L08	3130-0000-014	D-3
IC1202	OP/AMP LM358N	3130-3167-909	C-4
IC1203	8-1 Select CD4051BE	3130-3193-517	C-5
IC1204	Ripple Cntr. CD4017B#	3130-3193-516	C-6
IC1205	Dual Bin Cntr. MC14520	3130-3193-522	B-6
IC1206	Hex Invert. MC14584B	3130-3422-002	B-7
IC1207	Decoder LM567N	3130-3167-902	D-7

13 male amp pins	2107-0000-003	
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<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>ZONE</u>
<u>RESISTORS</u>			
R1201	15K, 1%	4709-1502-011	D-8
R1202	1K, 1/8W 5%	4704-0102-031	C-6
R1203	10K 1/8W 5%	4704-0103-031	D-6
R1204	100K 1/8W 5%	4704-0104-031	D-6
R1205	4.7K 1/8W 5%	4704-0472-031	C-7
R1206	47K 1/8W 5%	4704-0473-031	C-7
R1207	1 meg 1/8W 5%	4704-0105-031	B-8
R1208	150K 1/8W 5%	4704-0154-031	B-8
R1209	1 meg 1/8W 5%	4704-0105-031	B-7
R1210	100K 1/8W 5%	4704-0104-031	A-7
R1211-1234	not used		
R1235	100K 1/8W 5%	4704-0104-031	B-4
R1236	100K 1/8W 5%	4704-0104-031	B-4
R1237	10K 1/8W 5%	4704-0103-031	A-4
R1238	10K 1/8W 5%	4704-0103-031	B-5
R1239	10K 1/8W 5%	4704-0103-031	A-3
R1240	4.7K 1/8W 5%	4704-0472-031	D-5
R1241	10K 1/8W 5%	4704-0103-031	C-6
R1242	4.7K 1/8W 5%	4704-0472-031	A-4
R1243	*1.3K 1/8W 5%	4704-0132-031	D-8

CAPACITORS

C1201	TC .01mf	1538-0103-804	D-7
C1202	TC .01mf	1538-0103-804	D-6
C1203	Rad Mon .022mf 5%	1518-0223-006	C-8
C1204	Tant .47mf	1515-0478-005	C-8
C1205	TC .1mf	1539-0104-706	C-7
C1206	TC .1mf	1538-0104-706	C-6
C1207	Tant 2.2mf	1515-0229-005	B-7
C1208	Tant .47mf	1515-0478-008	B-8
C1209	Tant 2.2mf	1515-0229-005	D-4
C1210	not used		
C1211	not used		
C1212	not used		
C1213	not used		
C1214	Rad Mon .01mf	1518-0103-005	B-5
C1215	not used		
C1216	Rad Mon .01mf	1518-0103-005	A-4

TRANSISTORS

Q1201	SPS-952-2 NPN	4801-0000-016	D6
Q1202-1210	not used		
Q1211	SPS-952-2 NPN	4801-0000-016	B-4

DIODES

CR1201	IN4148	4805-1241-200	B-8
CR1202	IN4148	4805-1241-200	B-7
CR1203	IN4148	4805-1241-200	B-7
CR1204	IN4148	4805-1241-200	B-7
CR1205	IN4148	4805-1241-200	B-7
CR1206	not used		

\*nominal value only



<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>ZONE</u>
CR1207-1220	not used		
CR1221	IN4148	4805-1241-200	A-5
CR1222	IN4148	4805-1241-200	A-5
CR1223	IN4148	4805-1241-200	A-5
CR1224	IN4148	4805-1241-200	B-3
CR1225	IN4148	4805-1241-200	A-3

INTEGRATED  
CIRCUITS

IC1201	5V REG 78L05	3130-0000-013	D-3
IC1202	not used		
IC1203	8-1 Select CD4051BE	3130-3193-517	C-5
IC1204	Ripple Cntr. CD4017BE	3130-3193-516	C-6
IC1205	Dual Bin. Cntr M4520B	3130-3193-522	B-6
IC1206	Hex Invtr. MC14584B	3130-3422-002	B-7
IC1207	Decoder LM567N	3130-3167-902	D-7

